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ORIGINAL ARTICLES.

OPTIC NEURITIS DEPENDENT UPON INFLAMMATION IN THE ETHMOID CELLS.*

By M. H. Post, M.D.,
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The recognition in late years of the connection between various eye troubles and inflammations of the sinuses opening into the cavities of the nose, has added very much to the accuracy of ophthalmic diagnosis and to the satisfaction of ophthalmic practice. It may also clear up the ætiology of some of our former cases where the patient was correct in attributing loss of vision to a cause which at the time seemed to us quite doubtful or inadequate.

I have now in mind an experience of my own, where a woman consulted me for an optic neuritis. I treated her for a long time, getting, I think, a fairly good result; sufficiently good to keep her confidence. She referred her trouble to her son having turned a watering hose on her, drenching her clothing with water. She "took cold", and as result of this "cold" she was losing her sight.

I was inclined to regard this as a coincidence, not holding the relation of cause and effect, and to look elsewhere for the true origin of the trouble, suspecting that possibly syphilis had been introduced into the family by her thoughtful and anxious husband. He was a railroad conductor. He denied any luetic experience, but suffered from various indefinite nervous symp-

*Read at the April meeting of the St. Louis Ophthalmological Society.

toms. I could get no other conditions suggestive of syphilitic infection in his case. This was before the discovery of the Wassermann test.

I believe now that, as a result of the chilling of this woman's body, an inflammation in the sphenoid or ethmoid cells was lighted up; secondary to that an optic neuritis had supervened, and that the woman's theory of the ætiology of the disease was correct, rather than mine.

So many cases of optic neuritis depending upon inflammation of the ethmoid or sphenoid sinuses have been reported, that in this condition of the optic nerves I make a practice of having the ethmoid and sphenoid cells investigated, and where they are found to be inflamed I feel justified in considering the sinusitis as the cause of the optic neuritis.

Notwithstanding our confidence that this explanation is correct from what we read of the experience of others, a typical case in our own experience increases our confidence, and makes us feel that one more of the difficult and obscure points in ophthalmic ætiology has been cleared up. And this confidence gives us greater satisfaction and pleasure in the practice of our speciality.

Having recently been so fortunate as to have such a case come into my care, I think it may be of interest.

August 1, 1912, a boy 16 years old, consulted me on account of failing vision and headaches. The family physician, John F. Harrison, of Mexico, Mo., came with him, which makes the history of the case particularly reliable.

While the patient was a boy in years, he was a man in physique. His vision was 1/192 O.D., 3/120 O.S. The ophthalmoscope showed a swelling of 4 d O.D., 6 d O.S.

The history of the case was, that five weeks before consulting me, following a period of five days, during which he had slept on an average only an hour and a half every twenty-four hours, his sight began failing. Two and a half weeks later the front part of his head began aching, this gradually growing more severe until the pain became so intense that he was unable to sleep at all for five consecutive nights, and a hypnotic had to be given to induce sleep.

There had been some nausea but no vomiting. He had also had some fever, but the temperature did not go above 102°. When I first saw him his temperature was 100.4, pulse 65.

He had been using "eye drops" for his failing vision, obtained

from a druggist, till he consulted Dr. Harrison, who recognized the seriousness of his condition and brought him to me.

I found that there was considerable sensitiveness at the upper inner angles of each orbit. From this sensitiveness and from the location of the headache, and the swollen condition of the optic discs I made a diagnosis of an inflammation of the frontal, ethmoidal and possibly sphenoidal cells; of course, subject to what the rhinologist might find. Naturally I was very much alarmed about the condition of the patient, especially as I had seen two deaths rapidly supervene on such conditions; once in the case of a man brought into St. Luke's hospital, with pain in his forehead and eye protruding, who was referred to me as an eye case. He died within a few hours after admission. Again in the case of one of my personal friends, who was suffering from severe headache, and was in a semi-comatose condition when I saw her, I advised the family physician in charge of the case to call in a rhinologist, but he did not do so, and this patient also died in a few hours. Remembering these cases, I advised Dr. Harrison to take the case immediately to a very competent nose and throat man, who reported that the findings were negative, but that he would like to see the patient again. In view of this answer and fearing that we might have a cerebral tumor to deal with, Dr. Harrison and I decided to consult a neurologist. Accordingly we took the patient to Dr. M. A. Bliss, who said there was no tumor. With this excluded, it was decided to have the nose and sinuses again examined. Through a misunderstanding of the relation of the case to the nose and throat man, who had already made an examination and had asked to examine the patient again, the case was referred to Dr. Hanau Loeb. Dr. Loeb examined the patient three or four hours after the other rhinologist had examined and treated him. Dr. Loeb found evidences of an ethmoiditis and advised an immediate operation.

The next morning an examination of the eyes, made at the Jewish Hospital by Dr. Shahan, showed little if any change. Later in the morning the post ethmoidal cells were operated on by Dr. Loeb.

Twenty-four hours later, the report was a comfortable night, patient better in all respect. Vision had risen from 1/192 to 3/75 O.D. and from 3/120 to 3/12 O.S. Highest part of the disc O.D. seen with +1. d. sph., the macula emmetropic. The highest part of the disc O.S. seen with +3. d. sph., the macula

emmetropic. There were no hæmorrhages nor other lesions in any part of the fundus of either eye. The examination on August 3rd, the morning after the operation, was made by Dr. Wm. E. Shahan under a mixture of cocain and euphthalmin one per cent. each.

August 8th: V. 20/24, nearly normal either eye; disc O.D. swollen to 3 d., that of O.S. to 4 d. Bichloride of mercury one-twelfth grain, to be taken three times a day, was prescribed, and the patient was sent home to report in two weeks.

August 29: O.D. with +1. d. cyl. ax. vert. V. 20/12; O.S. with +1. d. cyl. ax. vert. V. 20/19.

A most rapid improvement in three weeks. The ophthalmoscope showed about 1 d. of swelling of disc O.D. or O.S.

September 18th. The patient had had no headaches lately. For the last two weeks had been "working in the field." With correction of August 29th, V. 20/15 O.D. or O.S. Discs are seen best with +1. d. sph.

When last seen, December 14th, 1912, patient was well. With +0.5 cyl. ax. vert. V. 20/12 either eye, and he read pleasantly with this correction.

The form fields, some of them taken as early as August 8th, 1912, were normal.

An important lesson to be drawn from this experience is that the rhinologist must be allowed plenty of time to make a diagnosis in these cases. I presume the examination made by the first rhinologist, and the shrinking of the tissues following the use of cocaine at the first examination, opened the passages between the ethmoidal and sphenoidal sinuses and the nose, allowing the pus contained in the sinuses to escape into the nose showing the condition of the sinuses and clearing up the diagnosis. Probably if the patient had returned to the physician who first examined him, as was requested, that physician would have found the same condition as was found by Dr. Loeb.

A CASE OF OCULAR TUBERCULOSIS WITH NOTABLE ASTIGMATIC VARIATIONS.*

By W. E. Shahan, A.M. M.D.,
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It is difficult to find references, either in text books or journals, to astigmatic variations, occurring during the course of disease of the chronic, frequently painless, nature which ocular tuberculosis may assume. And yet the over-looking of such variations, either because of the tedium of their correction, or because of intense preoccupation with the diseased tissues, may result in considerable mental and physical distress to the patient, and cause unexplained marked variations in visual acuity.

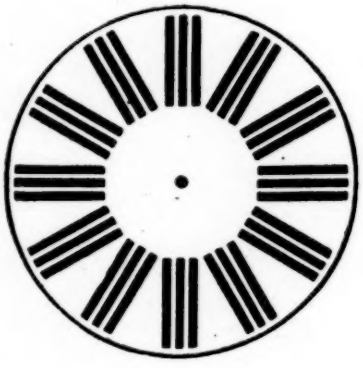
This patient, a vigorous, well nourished boy, 14 years of age, was brought by his parents, August 14th, 1911, to consult my senior associate, Dr. John Green. Owing to his absence, the management of the case at first fell to me and was later conducted by us jointly. The family history was good, with the exception of an aunt who had been treated for tuberculosis, and of a cousin who had "gone blind from some slow disease."

His history and condition were as follows: O.D. inflamed without pain or discharge 2 months; O.S. 6 weeks. Had been under care of three ophthalmologists. Pupils dilated ad max. Marked conjunctival and ciliary injection O.D.; same condition less marked O.S. Without glass V. 20/75 O. D.; 20/75 O.S. Was wearing O.D. +0.62 cyl. ax. vert.; O.S. +.75 cyl. ax. vert.; prescribed by an ophthalmologist three weeks previously. Media clear and fundus normal O.D. and O.S. No mydriatic was used that day and on the following day there was out-spoken iritis with adhesions O.D. By the afternoon of the same day these adhesions yielded to treatment with atropine.

Since the treatment of this case extended over a period of more than a year and numerous refractive measurements were made, a brief description of the mode of making these measurements will be given. First, an ophthalmometric measurement was made by means of a Kagenaar model of Javal's ophthalmometer. The total refraction was then determined by means of astigmatic dials and trial case measurements. The dials used were mainly the dials A.P.U. and V., described by Dr. Green

*Read before the Ophthalmic Section of the St. Louis Medical Society, May 7, 1913.

in the Transactions of the American Ophthalmological Society, Vol. II, part IV, 1878. The dial P has radiating lines at intervals of 30°, the width of each line subtending an angle of 2 minutes at 8 meters. This affords very distinct lines with large contrast and simple arrangement, so that patients with only moderate ability in perception of differences are able to indicate the dominant meridian in cases of 0.25 D. or over, provided they are not in a state of mental perturbation. The principal meridian having been determined to within 7° by shifts in the position of the dial P, the dial V was then employed for locating its exact position. In this patient perception of luminosity difference was unusually acute, being measured by about 0.12 D. He was easily able to detect differences in the brightness of the wedges if they were 2° or 3° away from a symmetrical posi-



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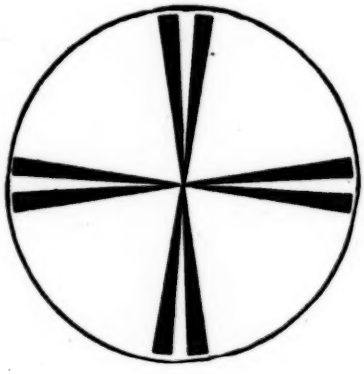

U

tion on either side of the principal meridian. After the accurate location of the principal meridian, the dial U was used and the two arms of the cross made to appear alike by successive cylindric additions. Maximum visual acuity was then obtained by ± spherical additions, and as this also increases acuteness of difference perception, the dial U was again referred to and additional seeming differences in the arms of the cross eliminated.

If now the astigmatic foci were accurately equalized, a weak cylinder, say +0.25 D applied to the correction found, would cause either of the principal meridians to become the dominant one, so that either arm of the cross would be made to appear "blacker", "more distinct", or "printed with blacker ink", than the other. This artificial reversal at will of the principal merid-

ian is to me an *experimentum crucis* in the equalization of astigmatic foci, and I am never satisfied with a correction in which I cannot obtain it except in cases with unusually dull difference perception, when other measures have to be resorted to. With the completion of these measurements a rapid checking of results was made by empirical methods dependent upon the relation of visual acuity to spherical and cylindric additions and upon variations in the position of the axis of the cylinder.

This, with slight variations, is the routine manner in which all measurements noted below were made. The general clinical picture now, August 15th, 1911, was one of conjunctival hyperæmia and circumcorneal injection O.D. and O.S. with out-spoken iritis and slight adhesions O.D. In all measurements noted below the ophthalmometric measurement is placed on the left and the total correction on the right.

August 15: O.D. As. 3.25 Mc vert.; —1.50 sph +3.00 cyl. ax. vert. V. 20/24. O.S. As. 2.00 Mc 100°; +2.00 cyl. ax. 105° V. 20/15+.

August 21: Internal therapy with sodium salicylate and aspirin instituted on a theory of rheumatism.

August 28: O.D. As. 2.25 Mc vert.; +1.75 cyl. ax. 85° V. 20/19. O.S. As. 2.25 Mc 105°; —0.75 sph.+2.25 cyl. ax. 95° V. 20/15+.

September 1: Several small deposits noted on posterior surface of cornea O.D.

September 4: Fine gray streak extending from below and from temporal side half way to center of cornea. Also small brownish conical protuberance extending from nasal edge of iris upon lens O.D.

September 8: Increased clouding O.D. Also fine streak extending upwards across cornea O.S. With a +20 D. lens clouding appears as numerous fine gray points on the posterior surface of the cornea.

October 5: Conical protuberance noted September 4th gone. Routine taking of temperature 4 or 5 times a day instituted.

October 28: O.D. As. 1.25 Mc 105°; +0.50 sph. +0.87 cyl. ax. 100° V. 20/12. O.S. As. 2.50+ Mc 70°; —0.75 sph. +2.50 cyl. ax. 75° V. 20/12.

Temperature has ranged around 99° since October 5th. Von Pirquet test made by Dr. A. E. Taussig.

October 29: Vigorously positive reaction to Von Pirquet test. Tuberculin therapy instituted with very small initial dosage. Salicylates stopped.

November 13: O.D. As. .75+ Mc 105°; +0.50 sph. +0.75 cyl. ax. 100° V. 20/12. O.S. As. 3.00 Mc 73°; —1.00 sph. +2.87 cyl. ax. 73° V. 20/15+.

Fundus normal; media clear O.D. except for a thin nebula on temporal side of cornea. Fundus normal. Counted 26 dots on posterior surface of cornea O.S. with +20 D. lens behind ophthalmoscopic mirror.

November 18: More precipitation on posterior surface of cornea O.S. Not collected in triangular form below but scattered discretely over surface.

November 30: Slight local tuberculin reaction.

December 7: O.D. very quiet; atropin instillation O.D. discontinued.

December 10: Deposits on posterior surface of cornea O.S. completely gone.

December 17: O.D. As. 0.50+ Mc 120°; +0.50 cyl. ax. 100° V. 20/12. O.S. As. 4.50 Mc 75°; —1.50 sph. +4.25 cyl. ax. 80° V. 20/15+. O.S. quiet; atropin instillation omitted.

December 23: O.D. As. 0.5 Mc 100°; +0.50 cyl. ax. vert. V. 20/12. O.S. As. 4.75 Mc 70°; —1.50 sph. +3.50 cyl. ax. 73° V. 20/12.

There is now a grayish infiltration from the temporal side of the cornea O.S. It has a blunt apex 1½ mm. broad and extends to within 1 mm. of the centre of the cornea. Within it are small dense gray dots. Strong Coddington lens shows minute bloodvessels extending from its base for 2½ mm. upon cornea. It is probably directly responsible for the increase in corneal astigmatism O.S.

January 1, 1912: New inflammatory focus developing at nasal side O.D. involving conjunctiva and probably superficial layer of sclera. Gray area on cornea O.S. generally thinner. No deposits on posterior surface of cornea O.D. or O.S.

O.D. As. .5+ Mc vert.; +.5 cyl. ax. vert. V. 20/15+. O.S. As. 3.75+ Mc 75°; —.75 sph. +3 cyl. ax. 75° V. 20/12—.

January 5: There are numerous small translucent trachoma-like granules on nasal side of conjunctiva and on surface of caruncle O.S. These granules are freely movable with the conjunctiva.

January 11: O.D. As. 1.+ Mc 75°; +.62 ax. 75° V. 20/12—. O.S. As. 3.25 Mc 75°; —1.25 sph. +3 cyl. ax. .75° V. 20/15+.

Only one dense gray point in corneal area of grayish infiltration O.S., noted December 23d.

January 28: O.D. As. 1.5 Mc 55°; +1.25 cyl. ax. 60° V. 20/15—. O.S. As. 3.25 Mc 85°; —1. sph. +3 cyl. ax. 80° V. 20/15+.

Inflammatory focus at nasal side O.D., noted January 1st, now ridge-like with its summit along the line of contact of the closed lids. At the termination of this ridge at the limbus is a small well-defined nodule. Along the summit of the ridge are several nodules in process of retrogression.

February 3: Nodule near limbus O.D., noted January 28th, is pitted in the top and entire swelling is diminishing. Trachoma-like granules O.S. scanty.

February 14: O.D. As. 2.75 Mc 43°; —.25 sph. +2.25 cyl. ax. 43° V. 20/15+. O.S. As. 3.25 Mc 85°; —.75 sph. +2.75 cyl. ax. 80° V. 20/12.

There is a yellowish fleshy infiltration O.D. extending about 1 mm. upon cornea and 5 mm. along nasal side of limbus. This is an extension upon the cornea of the ridge-like swelling noted January 28th.

February 17: O.D. As. 2.50 Mc 60°; —.25 sph. + 1.75 cyl. ax. 55° V. 20/12. O.S. As. 3.00 Mc 85°; —.75 sph. +3.00 cyl. ax. 85° V. 20/12. +

February 27: O.D. As. 2.25 Mc 73°; +2 cyl. Mc 70° V. 20/12. O.S. As. 3.00 Mc 83°; —.75 sph. +3.00 cyl. ax. 85° V. 20/12.

March 5: O.D. As. 2.25 Mc 80°; —25 sph. +2. cyl. ax. 75° V. 20/12. O.S. As. 2.75+ Mc 85°; —.75 sph. +3 cyl. ax. 85° V. 20/12.

March 17: O.D. As. 1.75 Mc 85°; +1.50 cyl. ax. 75° V. 20/12. O.S. As. 2.50 Mc 85°; —.75 sph. +2.50 cyl. ax. 87° V. 20/12.

March 27: O.D. As. 1.75 Mc 90°; +1.50 cyl. ax. 85° V. 20/15. O.S. As. 2.25+ Mc 90°; —.75 sph. +2.50 cyl. ax. 87° V. 20/15.

March 28: To this date the clinical course has been one of gradual subsidence of all inflammatory symptoms. The ridge-like swelling with its slight corneal invasion O.D. has about disappeared. Now a new inflammatory area appears on the lower nasal side of the conjunctiva O.S. There are trachoma-like granules on this, but it does not invade the cornea.

April 5: O.D. As. 1.50 Mc vert.; +1.25 cyl. ax. 85° V. 20/12. O.S. As. 1.25 Mc 120°; +.50 sph. +1. cyl. ax. 115° V. 20/12.

This astonishing change in the astigmatism O.S. is probably

due to a gradual increase in the intensity of the new inflammatory focus.

April 6: Slight haziness of cornea O.S. bordering inflamed area in lower nasal side of conjunctiva.

April 14: O.D. As. 1.75 Mc 90°; +1.25 cyl. ax. 95° V. 20/12. O.S. As. 4.25 Mc 145°; —1. sph. +2.25 cyl. ax. 110° V. 20/15.

There is now a grayish infiltration of cornea O.S. extending from lower nasal limbus to within 1½ mm. of centre of cornea. This grayish area contains within it small circular dots of a denser gray and is near enough to the corneal centre to interfere with the reflection of the mire and produce an apparent corneal astigmatism 2 D greater than the total astigmatism. Fundus normal, no "keratitis punctata."

May 5: O.D. apparently well, O.S. generally better.

June 6: O.D. As. 1.50 Mc 100°; +1.50 cyl. ax. 90° V. 20/12. O.S. As. 2.25 Mc 90°; +2.25 cyl. ax. 100° V. 20/12.

O.S. now very quiet. Bloodvessels have reached out and encircled dense gray dots in area of infiltration. There is an especially large gray dot near the apex of this area. It is surrounded by fine bloodvessels and is retrogressing.

June 23: Marked local and general reaction to tuberculin injection of yesterday. The dosage has now reached about one-fiftieth mmg.

June 27: Vigorous local and general tuberculin reaction to injection of yesterday. Temperature 100.6 F. Inflammatory symptoms greatly increased O.D. and O.S. Patient in evident distress. This was the last tuberculin injection given.

July 19: O.D. As. 1.50 Mc 100°; O.D. +1.25 cyl. ax. 100° V. 20/12. O.S. As. 4.00 Mc 87°; O.S. +2.50 cyl. ax. 90° V. 20/15+.

Some distortion of image reflected from lower part of cornea O.S. Tuberculin reaction of June 27th not entirely subsided.

July 22: All active inflammatory symptoms gone O.D. and O.S. Patient given simple collyrium and sent home to report in September.

September 3: "No trouble."

O.D. As. 1.5 Mc 83°; +1.25 cyl. ax. 93° V. 20/12. O.S. As. 3.75+ Mc 90°; +3. cyl. ax. 100° V. 20/12.

O.D. entirely quiet, O.S. entirely quiet except for a small pale rose colored area between inner limbus and caruncle. Area of infiltration lower nasal quadrant of cornea O.S. now com-

pletely inactive. The blood vessels have atrophied and the dense gray dots are now filled with a chalk-like deposit and surrounded by a thin areola of scar tissue. The scleral conjunctiva is nowhere injected but still shows O.S. a few trachoma-like granules. . The patient has gained 55 pounds in weight during the year. This is probably largely natural growth.

January 1, 1913: O.D. As. 1.50 Mc vert.; O.D. +1.25 cyl. ax. 93° V. 20/12. Os. As. 3.25 Mc 88°; O.S. +2.75 cyl. ax. 102° V. 20/12.

O.D. appears completely cured. No scars or vascularization of cornea. O.S. still shows a few trachoma-like granules in conjunctiva to nasal side and very small ones along lower limbus. Eyes generally quiet. Sometimes "get a little red and sensitive to light." Chalk-like deposit, noted September 3rd, now yellowish and apparently dissolving. Scar O.S. very thin with very fine vessels around chalk-like deposit. Patient has lived much out of doors. General health excellent. No evidence of tuberculosis in any other part of the body has ever been obtained by Dr. Taussig in numerous examinations. The most important changes in the total refraction are shown in the following table:

	O. D.				O. S.			
Date	Sph.	Cyl.	Ax.	V.	Sph.	Cyl.	Ax.	V.
1911.								
Aug. 15,	—1.50	+3.00	90°	20/24		+2.00	105°	20/15
Aug. 28,		+1.75	85°	20/19	—0.75	+2.25	95°	20/15
Oct. 28,	+0.50	+0.87	100°	20/12	—0.75	+2.50	75°	20/12
Nov. 13,	+0.50	+0.75	100°	20/12	—1.00	+2.87	73°	20/12
Dec. 17,		+0.50	100°	20/12	—1.50	+4.25	80°	20/15
Dec. 23,		+0.50	90°	20/12	—1.50	+3.50	73°	20/12
1912.								
Jan. 1,		+0.50	90°	20/12	—0.75	+3.00	75°	20/12
Jan. 11,		+0.62	75°	20/12	—1.25	+3.00	75°	20/12
Jan. 28,		+1.25	60°	20/15	—1.00	+3.00	80°	20/12
Feb. 14,	—0.25	+2.25	43°	20/15	—0.75	+2.75	80°	20/12
Feb. 17,	—0.25	+1.75	55°	20/12	—0.75	+3.00	85°	20/12
Feb. 27,		+2.00	70°	20/12	—0.75	+3.00	85°	20/12
Mar. 5,	—0.25	+2.00	75°	20/12	—0.75	+3.00	85°	20/12
Mar. 17,		+1.50	75°	20/12	—0.75	+2.50	87°	20/15
Mar. 27,		+1.50	85°	20/15	—0.75	+2.50	87°	20/15
April 5,		+1.25	85°	20/12	+0.50	+1.00	115°	20/12
April 14,		+1.25	95°	20/12	—1.00	+2.25	110°	20/15
June 6,		+1.50	90°	20/12		+2.25	100°	20/12
July 19,		+1.25	100°	20/12		+2.50	90°	20/15
Sept. 3,		+1.25	93°	20/12		+3.00	100°	20/12
1913.								
Jan. 1,		+1.25	93°	20/12		+2.75	102°	20/12

In every test precaution was taken by numerous changes in number and variety of test letters and objects to eliminate all elements of memory subconsciousness or otherwise, so that the above statements of visual acuity may be depended upon as representing fact as rigidly as it is possible to obtain it by subjective testimony.

CONCOMITANT CONVERGENT SQUINT; VALUE OF CORRECTION GLASSES IN ITS TREATMENT.

D. F. Harbridge (*N. Y. Med. Jour,* Jan. 25, 1913) refers to the theories of Donders and Worth as to the cause of concomitant convergent squint. Concerning the latter he thinks the loss of the fusion faculty is more likely to be a result than the cause of squint. He is so strongly impressed by the almost constant association of hyperopia, inducing additional accommodative effort, with esotropia, that he is quite firmly of the opinion that it explains the majority of the cases of convergent squint. Permanent monocular and periodic squint are the two forms that respond most favorably to treatment by the wearing of full correcting lenses. In alternating squint the condition is often influenced but little by the wearing of glasses. The proper glasses should be adjusted early in these cases, as early as the second year of the child's age. He condemns as especially pernicious the advice "to wait and the child will outgrow the defect." Where the wearing of the proper glasses does not early correct the deviation the blurring of the vision of the fixing eye by the use of atropin is advised. Harbridge's rule is to have the child wear a darkly smoked lens of the strength of the child's correction over the atropinized eye. The atropin is used in the fixing eye for one month, then stopped two weeks, and, if necessary, then used another month. If necessary to continue this treatment very long it is advisable to stop the atropin in the fixing eye and use it in the deviating eye for one or two weeks. These patients should be kept under observation until they are six or seven years of age, when the fusion faculty is usually fully established.

MEDICAL SOCIETIES

OPHTHALMIC SECTION.
St. Louis Medical Society.

March 5, 1913.

Two Operative cases (*a*) *Frost-Lang Operation.* (*Implantation of Glass Ball in Tenon's Capsule.*) (*b*) *Heisrath's Excision of the Tarsus.* Presentation of patients.—By Dr. John Green, Jr.

This patient, a little girl, came to the Children's Hospital about a month ago. She is, as you see, a victim of ophthalmia neonatorum. In the right eye the lower portion of the iris is engaged in a corneal scar. There is an anterior polar cataract. The left eye was distended and sightless and painful at times, so I decided to enucleate it. I thought it best to insert a solid glass sphere into Tenon's capsule because, as we know, after simple enucleation in the children there is apt to be failure of development of the bony structures of the orbit. I hope that the implantation of the solid sphere may prevent this secondary failure of osseous development. Dr. Greenwood, of Boston, has done this operation in about 75 cases and it was on his recommendation that I first undertook it. The technique is exactly as Dr. Greenwood outlined it to me. The conjunctiva is incised in the usual way, each rectus tendon is caught up by a Prince's advancement forceps, the conjunctiva is well separated from the muscle, and the muscle from the globe. A silk suture is then passed through each rectus tendon. The eyeball is very carefully enucleated and all bleeding checked. That is a very important point. A purse string catgut suture is then put around the edge of Tenon's capsule. An assistant places the glass ball (about the size of a small marble) in the cavity, holds it in with gauze and the purse string suture is tied. The glass ball is now completely covered, and the rest of the operation consists simply in tying the external to the internal rectus and the superior to the inferior and then taking three or four interrupted sutures to approximate the conjunctiva. The reaction after the operation varies very greatly. In one of my cases there was tremendous swelling and pain, controlled in the course of 48 hours by

cold applications. In the others the reaction has been no greater than what usually follows a simple enucleation. This operation was performed only thirteen days ago. You will notice that there is much less sinking in of the upper eyelid than is the case after simple enucleation. The rotations of the prothesis are better than after simple enucleation in the lateral direction, but not in the vertical direction. The child has only worn an artificial eye for a day, so we may hope that the cosmetic result will eventually be better than at present.

The second patient is a boy on whom I have performed the Heisrath excision of the tarsus. He has been treated at the various eye clinics for trachoma for the past four or five years with only temporary improvement. He was just entering the cicatricial stage. No pannus. Last summer my first experience with this operation was an encouraging one. A young woman came to me with a very bad trachoma of seven or eight years' standing, extensive pannus and ulceration; in a word, the usual picture of a badly neglected trachoma. I excised the tarsus in both eyes and in six weeks all the ulcers had healed, the pannus had cleared up, vision had greatly improved and at last reports, five months after the operation, there were no signs of inflammation in the eyes. This operation is gaining a great deal of favor in New York. Dr. Woolton and Dr. Claiborne are ardent champions of this procedure. The first man in this country to speak of it and to advocate it with favor was Dr. Casey Wood of Chicago. I suppose you are all familiar with the technique of the operation. The lid is everted and these forceps applied (designed by a nurse at the New York Eye and Ear Infirmary). Another forceps designed by Dr. Claiborne may serve a bit better. The tarsus is clamped at its lower edge and the lid lifted up, thus displaying the superior fornix. The incision is made along the upper edge of the tarsus, and goes through the conjunctiva. The conjunctiva is then dissected backward towards the fornix and a little on to the globe and three double armed sutures are inserted. The clamp is removed. For the second part of the operation, I use Dr. Ewing's excellent lid forceps. The second incision cuts through the tarsus from the outer to the inner angle, 3 mm. back from the ciliary border. The aim is to make the ends of this incision curve around and meet the ends of the first incision. For the freeing of the tarsus I use a thin knife rounded at the end. The lid is replaced in normal position, the position of the sutures is care-

fully noted in order that they may be brought out through the skin of the lid at a point opposite to the point of insertion. I have followed Claiborne's suggestion and brought out the stitches through the skin of the lid rather than through the anterior remnant of tarsus, as advised by Heisrath and other operators.

DISCUSSION.

Dr. Wiener: I have never seen any advantage in introducing an artificial globe, either glass or metal. I see a great many objections. It is rather early to remark upon this case as the operation was recent and there is still quite a bit of swelling, but it appears to me that there is very much less excursion in any direction of this eye than in an eye where an evisceration has been done or an enucleation. And in an eye where evisceration has been done and the muscles are intact and in place in the sclera, it seems to me that there is not any more sinking in of the socket or of the upper lid than in this case, especially with a reform eye. Then besides, I think the patient is infinitely safer without anything introduced in that orbit. In the second case I do not see any special advantage gained in removing the tarsus, and I think it is a mistake to have the tarsus removed. There are very few cases that do not respond to local treatment, and I think I would rather have it take longer and have a better ultimate result than remove the tarsus immediately.

Dr. Charles: About the first case, the thing I like is that operation is especially adaptable to children because it would probably stimulate growth of the orbit, giving it a chance to develop, which it might not perhaps have otherwise. I would like to know if anybody has seen these glass balls after several years? Would they become rough in the course of time? Some of the constituents of glass (for example, sodium) are soluble. As to the second operation, it seems to me it is especially applicable in these rare cases where other treatment does not seem to avail. We, all of us, have an occasional case always with greatly thickened tarsus which suffers relapse after relapse, just as we believe that it is about well.

Dr. Jennings: I have had some experience in the use of glass globes, but on account of the reported danger of roughening after a series of years, the last ones I have used were made of gold. I agree with Dr. Wiener that if an evisceration is done you get a very movable, satisfactory stump. When I make the

incision I pull the muscle forward and tie it to the conjunctiva on that side. Of course, I believe that after every enucleation the muscles should be attached to the front portion of the stump, and not be allowed to fall back. In regard to the second case, it seems to me that the removal of the tarsus would be of benefit in those chronic forms of trachoma with entropion, but I should not care to remove it as long as the case was progressing nicely, and there was no particular amount of entropion.

Dr. Green, in closing: I know nothing about the erosion of implanted glass balls. Have you had any experience with them actually coming out? Dr. Jennings replied no. Dr. Sweet, of Philadelphia, recently reported a series of cases in which he had done the Frost-Lang operation, using metal (platinum and gold) balls. He followed up his cases carefully to determine, if possible, any bearing the operation might have on the subsequent development of sympathetic irritation or inflammation and was able to satisfy himself that no such relationship existed. The present case is perhaps not a fair test of the operation. The motility of the globes is and has been defective since birth. (Recall that the patient has been practically blind all her life.) We must remember, too, that the operation was done only thirteen days ago and the child has been wearing the glass eye only one day. No doubt the cosmetic effect would be better when the prothesis has been worn longer. In one of Dr. Greenwood's cases, the cosmetic result was so perfect that one could not tell at a distance of a few feet which was the natural and which was the artificial eye. There seems to be quite a difference of opinion as to the degree of motility after these operations. Dr. Sweet, in his series, found that the motility was distinctly greater in all directions than after a simple enucleation. In regard to Heisrath's operation. This operation has been performed by Dr. Kuhnt, of Koenigsberg, more extensively than by any other surgeon. When first taking up his work in a trachoma infected district, he found that many patients who came originally to his clinic would soon drift away and on seeking an explanation for these defections he found that his patients were going to another clinic to have the tarsus removed, and they were quickly relieved of all symptoms. He was therefore practically driven to perform this operation as a means of saving the prestige of his clinic. It seems to be the consensus of opinion of those who have performed this operation most frequently that there is a very positive indication for it. The case presented

had been under treatment for several years, had been subjected to several operations, and in spite of all presented all the earmarks of a progressive trachoma.

Hyalitis caused by (a) Pus-absorption and (b) by Intestinal Autointoxication.—By Dr. J. W. Charles.

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A case of Bitemporal Hemianopsia. (Presentation of Patient).—By Dr. Julius H. Gross.

Spiller, in Posey and Spiller, on the question of Tumors of the Pituitary Body, states:

"Tumors of the pituitary body not infrequently cause bitemporal hemianopsia, which later may give place to blindness. Choked disks may be associated with tumor of this part of the brain, but not infrequently the optic neuritis is of a mild grade or there may be optic atrophy from the pressure on the chiasm without previous neuritis. Polyuria and polydipsia, even diabetes mellitus, have been observed as signs of such a growth. Acromegaly has been found so frequently in cases in which the pituitary body was enlarged that some relation between this disease and the alteration of the pituitary body probably exists. Sufficient cases, however, have been reported to show that tumor of the pituitary body does not always cause acromegaly. Bitemporal hemianopsia is a common sign of acromegaly. Bitemporal hemianopsia can be caused only by a lesion at the chiasm."

Mrs. W., age 64, came to the O'Fallon Eye Clinic about 6 years ago with the following history: About two years ago while out walking with some friends she noticed that objects appeared double, and that she could see only one-half of the object. She consulted a prominent oculist who treated her for some time; the diplopia left, but her fields did not improve. At that time her vision was O.D. V=10/120; O.S. V=18/19. The vision in the temporal sides of both fields, excepting a small portion adjacent to the center of the field, was gone. The papillæ were a grayish white, the vessels of normal size, very much as they now appear. Not any swelling. There is nothing in the patient's past ailments having any connection with her present trouble, except that goitre came on at the age of 19.

Present condition: The patient feels well. Has normal appetite. Sleeps well, perhaps a little more than would be considered normal at her age She has excessive thirst. Perspires

easily on left side of face and body. The general physical examination shows that she still has goitre, the left lobe especially is large, although she states that it is much smaller than formerly. The left knee is stiff, an old trouble which has not any connection with the present ailment. There is present a fair percentage of sugar in the urine.

Condition of eyes: O.D. V=nil; O.S. V=18/19. The temporal side of field, except a small part near the fixation point, is dark. There is interlacing of the red and green color fields. The pupils respond when light is thrown on the seeing part of the left retina. Wernicke reflex sign present. The pupils contract in accommodation. Movements of the globes are normal.

The bitemporal hemianopsia would point to some trouble in the anterior part of the optic commissure, in the region of the sella turcica, and pituitary body. Signs and symptoms usually present in tumor of the pituitary body and absent in this case are: headache, nausea and vomiting, convulsions, vertigo, choked disk and acromegaly.

DISCUSSION.

Dr. J. F. Shoemaker: Dr. Gross's patient was seen by me in September, 1906. She had at that time complete bitemporal hemianopsia and stated that the trouble had begun a year previously. When I first saw her the vision was 18/24 in the right eye and 18/19 in the left, unimproved with lenses. Mercury, potassium iodid and strychnin were tried, but did not improve the condition. She was later referred to the clinic at the O'Fallon Dispensary. Several years later I had an X-ray taken of her head which failed to show any evidence of pituitary involvement, the sella turcica appearing entirely normal. Diseases of the pituitary body may cause different symptoms, depending upon whether the secretion of the gland is increased or decreased. When there is hypersecretion the body growth is likely to be stimulated excessively, causing gigantism in the young, and acromegaly in the adult. When the secretion is much diminished there is likely to be a rapid accumulation of fat and a stunting of the growth of the body, particularly of the sexual organs in the young, and in adults atrophy of the ovaries and testes resulting in cessation of the menstrual flow in women and impotence in men. The bitemporal hemianopsia in this case made me suspect a growth involving the pituitary body, but she had none of the symptoms of pituitary disease except the

hemianopsia. It is of course possible to have a tumor in this region which does not involve the pituitary body, but which, nevertheless, presses on the optic chiasm. Exception must be taken to the statement that bitemporal hemianopsia can be caused only by disease of the optic chiasm. A growth in front of the chiasm, between the optic nerves could so press against the inner sides of the nerves, without touching the chiasm, as to produce the same ocular symptoms as if the pressure were against the front part of the chiasm. At least one case of this kind has been reported.

Dr. Wiener: I have some interesting charts of bitemporal hemianopsia. The first patient presented himself for treatment early in January, 1911; when he came he was complaining of dimness of vision, the eyes being sensitive to light and suffering from seemingly rather an acute condition We found his vision to be 1/100 in the left and 1/300 in the right His field showed an almost complete bitemporal hemianopsia. This was taken on the 21st of January, 1911. This patient was treated by Dr. Wolfner and myself and was given a small dose of atoxyl; on February 24th, more than one month later, the fields were again taken and showed a marked increase in size, while his vision had increased to 14/80 in the right eye; and then on April 29th, 1912, the last time we saw him in the office, the fields were taken again and they were found to be almost normal as here shown. His vision was 14/50.

The second patient came to the Eye Clinic of Washington University; his fields were taken on the 8th of January, this year, and showed a bitemporal hemianopsia. This patient was referred to the surgical department, an X-ray was taken, and a diagnosis of pituitary tumor was made and a decompression operation was made through the nasal route. These are the fields taken at the hospital. The patient shows marked improvement.

Dr. Gross, in closing: I would only like to say that Dr. Shoemaker's criticism should have been directed at Dr. Spiller, as it was Dr. Spiller's statement, taken from Posey and Spiller's book, "The Eye and the Nervous System," that "bitemporal hemianopsia can be caused only by a lesion at the chiasm."

A Protractor for Use with the Single Cell Trial Frame.—By Dr. A. E. Ewing.

Dr. Ewing presented a protractor for use with the single cell trial frame which consists of two circles made up of short radiating lines of different lengths to represent the one, five and ten

divisions of the circle. The proximal ends of the five and ten degree divisions rest on an imaginary circle, which is the size of the outer edge of the 38 mm. ring of the trial lens, while the distal ends of the degree divisions rest on the inner edge of the mounting. For further accuracy in centering, the mounting across a vertical and horizontal lines, each 10 mm. long, is placed at the center of each of the circles. The circles are placed 21 mm. apart with their horizontal meridians in the same line and at their upper margin a horizontal dotted line is drawn tangential to both circles. The circles are designated by "R" for right and "L" for left, the latter corresponding to the left eye and the former to the right, as the lenses are worn by the patients.

To employ the diagram with the single cell trial frame, it is only necessary to place the cylinder of the right eye over the right circle, with the edge of the trial lens of the left eye against the tangent of the left circle, and note the position of the usual short marginal guide line, which indicates the axis of the lens, in degrees on the circle. For the left eye the lens is placed over the left circle with the edge of the right lens against the tangent of the right circle, and the position of the left lens is similarly noted in degrees. This diagram is printed on the prescription blank for the glasses, in order to have it always at hand and ready for use. It has proved to be a rapid, correct and satisfactory method for noting the axis of the cylinder when writing the record of the case, and for indicating it with a pen or pencil mark on a diagram for the use of the optician, as it plats the axis of the cylinder or the prism precisely as it is to be worn by the patient.

The conventional angular notation generally adopted in the graduation of circles, as used by Donders, and still in common use by probably the majority of ophthalmologists and opticians, has been retained. As only the 180 degrees are necessary for establishing the axis, the numbers are duplicated in the lower half of the circle in order to facilitate the reading.

DISCUSSION.

Dr. Luedde: I recall some of the incidents connected with the making of plano-convex and plano-concave trial lenses with special rings to enable the use of two lenses in a single cell frame, referred to by Dr. Ewing in his discussion preceding the presentation of this prescription blank protractor. The first case made in this way by the American Optical Co. was made for me. Its manufacture was the result of a personal visit of

Dr. John Green, Sr., at the A. O. Co.'s plant at Southbridge, Mass. Dr. Green selected the material for the rings, which were made according to his own diagrams. He further ordered the grinding of the higher lenses in smaller intervals and extended the series, both in sphericals and cylindricals, beyond the limits of cases of this type made in former years by Wall & Ochs. (The latter firm gave up their manufacture because it was not appreciated by the trade and unprofitable.) The case was delivered to me in March, 1908, but was returned for the correction of certain defects. Another was secured immediately, however. More recently I secured a supplementary case containing the lenses most frequently used. This latter was furnished at a very moderate cost, so that now this very convenient form of trial lens, whose presence on the market to-day we owe to the efforts of Dr. John Green, can be secured easily. It is a matter of surprise to those who know these cases from personal experience that any one tries to get along with any other type. The ability to place a cylindrical and a spherical lens in a single cell in a way that reproduces, almost perfectly, the single final lens called for by the patient's error of refraction, is an advantage not to be overlooked in different cases. Most of the advantages of the chart submitted to be used in specifying the axis of cylinders are, I believe, contained in this one which I have been using for two years. In addition, I have provided for the designation of the meridian according to any of three systems in general use, by having two sets of numbers in separate rings at the circumference. First accustomed to the designation of meridians beginning with zero at the horizontal and continuing around to 180°, I have later adhered to the use of the vertical meridian for the standard of comparison as seems natural in the consideration of corneal astigmatism. My own preference is the method devised by Dr. Green, almost fifty years ago, by which the meridians to the right are are indicated by the + sign before the numeral and those to the left are distinguished by the — sign. There is in my experience no confusion with the + and — sign of the lenses in this method. However, on my chart the letters N and T, printed on either side at the top, permit the use of the terms nasal or temporal to designate on which side of the vertical the axis should be placed. To determine the axis of a trial lens in a frame, I have always found the large flat protractor, used by Dr. M. H. Post for many years, more accurate than any small disc, and equally convenient.

THE OPHTHALMIC SECTION OF THE ROYAL SOCIETY OF MEDICINE.

Discussion on the Physiology of the Intra-Ocular Pressure.*

Mr. Martin Flack said that a perusal of the printed report of the discussion, so far, showed that Professor Starling and Professor Hill held very divergent views as to the circulatory conditions obtained in the eyeball. Professor Starling believes it to be the result of a mechanical process of filtration, and hypothesises a difference of 30 mm. of mercury between the capillaries and the fluid outside. Professor Hill believes that the aqueous is a true secretion; he regards the ciliary processes as being wet protoplasmic films, and does not believe that filtration can exist within the eyeball. Professor Starling said that he found it difficult to follow Professor Hill's reasoning, and therefore he (the speaker) would like to elaborate that reasoning a little more. These principles were based on Professor Hill's well-known work on the circulation in the brain; that work had now been published many years, and it had never been proved to be wrong. It was well known that on exposing the brain, the brain substance bulged into the trephine hole; this bulging was circulatory in origin, for when the circulation ceased the bulging also ceased. Therefore the brain-pressure was a circulatory pressure, which was left over when the pressure due to the resistance in the arteries had been overcome—i.e., the pressure in the capillaries of the brain and pia mater. The pressure required to balance this brain-pressure, as measured by the compensation method, was the same, within the limits of experimental error, as the pressure of the cerebrospinal fluid and the pressure in the cerebral veins. The least excess over this pressure presses blood out of the capillaries. When Professor Hill talked of capillary-venous pressure he knew that it was slightly higher in the capillaries than in the venous sinuses, a slight gradient being necessary to maintain the flow; but the pressure transmitted through the wall of the capillary was equal to, not greater than, that in the veins. The venous outflow was not impeded by the pressure transmitted through the capillary wall. And since the pressure was equal to that in the brain substance, and in the cerebrospinal fluid, there could exist in the brain no force capable of producing filtration. So, too, in the eye. The eye, although not absolutely

*Adjourned from December 12, 1912.

rigid, is sufficiently rigid for physiological purposes, and might more or less be regarded as a rigid box. Moreover, the skull of the child is not absolutely rigid, nor is that of a person who has been trephined, yet that weakening of the rigidity in no way interferes with the brain circulation. With regard to the eyeball itself, it had been shown by Koster that the raising of the pressure from 19 to 70 mm. of mercury increased the globe by seven-thousandths of its original volume. Thus the globe was not to any great extent distensible.

Mr. Priestly Smith argued that the eye was capable of expansion because it was dimpled by applying pressure. But he would give a simpler explanation of that—namely, that pressure forces blood from the eye, and this could be verified by the use of the ophthalmoscope. Let one suppose that the pressure in the choroidal fringes was greater than that in the other cerebral capillaries, and that the cerebrospinal fluid was filtered through by this access of pressure, then this fluid, being at a higher pressure, would compress the veins and capillaries elsewhere in the surrounding parts of the brain where the pressure was lower. The only condition in the brain under which filtration could take place was when the skull was freely opened, and the cerebrospinal fluid allowed to escape. So with the eyeball: the condition necessary for filtration, in his view, was for the eyeball to be freely opened, and then one got, not aqueous, but a different fluid. According to Professor Hill's view, the same conditions would obtain in any encapsuled organ, and in the limbs and other parts of the body. The flow of tissue fluid was maintained not by any filtration process due to *vis à tergo*, but to the pulsatile expansion and shrinkage of organs, the action of the respiratory pump, the expressive action of muscles, extrinsic and intrinsic, the effects of gravity and of pressure. It was sometimes urged that as the secretory pressure of a salivary gland could go above the circulatory pressure, that was a true secretion and that the aqueous was not. Professor Hill and he had examined that recently, and had shown that in such a gland there was a special arrangement of basement membranes and connective tissue, which enabled the secretory pressure to rise above the arterial pressure, and the blood flow was not interfered with. But their researches showed that in the eye the blood flow was interfered with when the pressure of the aqueous was made greater than the arterial pressure. Professor Starling said—and that they could confirm from their own researches—that there might be a

pressure of 5 mm. of H_2O in the tissue spaces—but he also stated there might be at the same time a pressure of 25 mm. of mercury in the capillaries. This, as the Professor said in criticism of Dr. Hill, is "pure assumption." Their experiments on tissue fluid were made by driving in a capillary needle under the skin, and measuring the pressure by the compensation method. The essential principle of the circulation was, that the heart pumped the blood into the capillaries, and that the movements of the body pumped it back again to the heart; that in the transference of the fluid by the secretory processes in the body, the controlling mechanism was the activity of the living cell, which was manifested in chemical reactions and physical phænomena, such as absorption and osmosis, and that this secretory process was the same as took place in the formation of and extrusion of the vacuoles by the protozoa, and in which filtration could play no part. The tissue cells draw in fluid from the capillaries and secrete it by the chemico-physical forces which pertain to living protoplasm.

Dr. Thomas Henderson said his views respecting the physiology of intra-ocular pressure were entirely dominated by Professor Leonard Hill's splendid work on the intracranial pressure, and therefore he maintained that the intra-ocular pressure was not a question of volume, but that, as in the case of the brain, it stood and varied with the intra-ocular venous pressure. He had not received the report of the last meeting, but he understood Professor Starling objected to that view, because it would mean that the venous pressure would be the same as the capillary pressure. Of course, such was not the case; the venous and the capillary pressures were distinct from each other and stood at different levels. The schema of the intra-ocular pressure, already referred to, showed that the intra-ocular pressure was the same as the venous pressure at the point of the venous exit. The points of the venous exit were, first and foremost for the subject under discussion, Schlemm's canal. The other points of venous exit were the veins crossing the supra-choroidal space to pierce the sclera, and finally the central retinal vein on the disk.

The arguments in favor of the venous exit level of the intra-ocular pressure could be stated very simply. Fluids were incompressible, transmitted their pressure equally in all directions, and always tended to lie at the lowest hydrostatic level. Now, in the elastic circulatory system of the eye the venous pressure at the point of venous exit was the lowest circulatory pressure,

therefore the intra-ocular pressure was maintained at this level, because such was the lowest hydrostatic level attainable in the eye. To put the arguments in another way, the intra-ocular pressure must be either greater, less than, or equal to the venous pressure at the point of exit. If the intra-ocular pressure of the aqueous was less than the venous pressure in Schlemm's canal, the aqueous could not get away and would stagnate. On the other hand, if the intra-ocular pressure were greater than the venous pressure, the venous walls of Schlemm's canal would be compressed. Now, although Schlemm's canal could not be observed, another point of venous exit, the central retinal vein on the disk, could be studied. By using an electric self-illuminating ophthalmoscope to observe the disk by the direct method, and at the same time applying the tip of the finger to the upper lid in the region of the external canthus, he noted that this very light touch at once caused the retinal vein, at its proximal extremity, to become shut down. If instead of using digital pressure one used a pressure gauge, as made for him by Messrs. Weiss, he found that a pressure of about 2 mm. of mercury was sufficient, in the normal eye, to produce such an effect. Now this effect was noted on a vessel whose walls were considerably thicker than the single layer of endothelial cells composing Schlemm's canal, but, in position, both vessels were points of venous exit. Therefore, if such applied pressure sufficed to cause diminution in the lumen at the point of exit of the retinal vein, it would produce a similar effect at all other points of venous exit, including Schlemm's canal. This clinical observation showed that the intra-ocular pressure cannot be a question of volume, but that the intra-ocular pressure and the venous pressure at the point of exit always balanced each other.

Professor Starling was an ardent advocate of the filtration theory of aqueous formation, and, at first sight, nothing appeared simpler. There were vessels on one side of a filtering membrane and filtrate on the other. But the theory took no note of the fact that the vessels were embedded in a loose tissue stroma, which stroma was in direct and open communication with the angle of the anterior chamber. The ciliary epithelium could not, therefore, act as a mere passive filtering membrane, because the pressure on both sides of it was the same, and if fluid did filter from the vessels, that would make its way direct into the angle of the anterior chamber.

Mr. Herbert Parsons said that, for various reasons, he proposed to deal only with a few points in this discussion. One rea-

son was that he felt quite unqualified to deal with the physical side of the problem in the face of Professors Hill's and Flack's and Mr. Thompson Henderson's views. But he did not understand the extraordinary antipathy which Professor Hill and his colleagues evinced towards filtration; they seemed to him, whenever possible, to introduce some difficult method of physio-chemical influence to explain processes which were subject to simpler explanation. He preferred to leave those questions in the hands of Professor Starling, who was present to reply on the discussion.

He thought Dr. Hill had laid unnecessary stress on the needle, and not so much on the beauty of his own needle as on the inefficiency of other people's. Dr. Hill's needle was admittedly a very beautiful instrument, but he did not think that gentleman had succeeded in attaining his aim. He understood him to say the sclera was a rigid box containing fluid, which was incompressible, and when Dr. Hill said "rigid" he probably meant rigid, while apparently some other people did not. That box was filled with fluid, and into it he forced a solid body of finite magnitude without losing aqueous, which seemed a difficult problem. The explanation would dobutless be that blood was forced out of the eye. If that were so, the intra-ocular pressure, being equal to the venous capillary pressure, the venous walls collapsed, and the pressure inside the globe must go up, and something must happen; either the walls must be ruptured, or the fluid must escape somewhere. The only point in which Professor Hill's work differed from that of previous observers was in the very high intra-ocular pressure he got in some experiments; and that was probably due to displacement of fluid by the needle. In avoiding one difficulty with extreme care, Dr. Hill had introduced another error in not allowing for the displacement of fluid by his needle. It would be noticed that the highest pressures, as set forth in the Royal Society papers, were produced with ether anæsthesia, and that might have something to do with it Another point was, that the walls of the globe *not* being rigid, unless the animal was curarized the extrinsic muscles might produce a relatively enormous effect upon the intra-ocular pressure. He believed he (the speaker) was the first to show that the increased pressure which was easily produced on stimulating the peripheral end of the cervical sympathetic was due to contraction of the unstriped muscle in the orbit. But how the fact that the extrinsic muscle pressure raised the pressure in the globe was to be explained on the theory that the walls of the

globe were rigid he failed to understand. Scorn had been cast on Koster's experiments, but for a globe to increase in volume 45 c.mm. with a rise of pressure from 20 to 70 mm. of mercury was quite appreciable, and how one could contend that the volume was constant under those circumstances he could not see. He thought secretion and absorption was fundamentally *a process* which was carried on by the capillaries. From the evolutionary point of view probably the earliest stage was that capillaries performed both functions, and physical forces were utilized, as Nature usually did use them, and in some such way as the following: The filtration process in the capillaries was brought about by a vasomotor mechanism; if the arteries were dilated there was a greater intra-capillary pressure, and a process of filtration or secretion went on. If the arterioles were constricted, the intra-capillary pressure was diminished, and absorption was permitted. He did not mean to say that the utilization of such physical processes in any way eliminated the activity of the living cells which formed the filtering membrane; they had their functions to perform. That was seen in the ease with which various immune bodies passed through the capillary walls whilst others were kept back by them. These substances followed no known physical laws. Agglutinins would soon go through into the normal aqueous, but if the animal were immunized to a foreign blood the hæmolytic elements would not go through, except under diminished intra-ocular pressure, when the aqueous had a much larger protein content. One could, then, understand that at a higher state of development and with the differentiation of different organisms the processes might be separated, one set of capillaries performing secretion and another absorption. The work of Leber and others tended to show that the principal function of the ciliary body was that of secretion, and that of the iris was absorption. On the other hand, the supply of nutrition to the choroid, for example, was carried out by the same capillaries as took the products away. If the experimental facts were not inconsistent with a purely physical explanation, one had no right to call in other factors until one knew that the known factors failed in some essential particular. In the contribution by Professor Hill and Mr. Flack the only experimental evidence brought forward was practically a repetition of what had been available from the work of many observers from 1850 onwards. They were at liberty to put forward any theory they wished, but it was necessary to bring forward some definite experimental evidence which was not explicable on cur-

rent views, or *per contra,* they must submit evidence which upset that already adduced.

Mr. Rayner D. Batten gave a demonstration, by means of toy balloons, of the relationship of tension to pressure. He said that the ocular tension, as felt by the finger, was a mixed sensation, including as it did, several factors—intra-ocular pressure, and resistance, the latter being divisible into two, in so far as it depended on freedom of exit of fluid from the globe, and on the elasticity of structures outside the globe, in connection with the fluid in the globe. A third factor was the tension of the structure itself.

The balloons demonstrate some of these points: The pressure in the various sections is the same, but the tension is markedly different. They also show that the tension can vary, depending on the condition of the wall, in different parts of the globe, although the pressure is the same. (1) They demonstrate that the feeling of resistance is largely dependent on the freedom of exit of fluid. (2) On the elasticity of structures connected with the fluid in the globe.

Mr. Greeves pointed out that an increase in the volume of the eyeball, with rise of intra-ocular pressure, could be easily shown. Koster, in his experiments, took measurements of plastic casts of eyes which had been subjected to various degrees of pressure, and found definite increase in volume with rise of intra-ocular pressure. Schulten obtained similar results by another method. He (the speaker) did some experiments with fresh pig's eyes and got similar results. He put the eyes in a bottle filled with saline and fitted with a rubber stopper, through which was passed a tube measured off in cubic millimetres, and a hypodermic needle connected with the eye inside the bottle, and with a pressure bottle outside. Changes in the volume of the eye were thus read of in cubic millimetres. With a pig's eye of average size, taking the normal intra-ocular pressure as 25 mm. of mercury, the increase in size was 1 c.mm. per millimetre of mercury rise of pressure. For the first 10 mm. rise of pressure above the normal the rate of increase remained the same, but thereafter it gradually became less. These results proved that the eyeball was not a rigid case, and that the increase in volume corresponding with even a slight increase in pressure was quite a measurable one.

Professors Hill and Starling replied at full length to the verious points raised during the discussion, and were heartily thanked by the Section.

ABSTRACTS FROM MEDICAL LITERATURE.

By J. F. Shoemaker, M.D.,
St. Louis, Mo.

PREVENTION OF PURULENT OPHTHALMIA IN THE NEWBORN.

P. Zweifel (*Zentralblatt für Gynäkologie,* July 6, 1912) emphasizes the value of prophylaxis concerning the infection of the eyes following childbirth. To determine the best solution to be used by the midwives, one that while effective would produce the least damage if used carelessly, he experimented on the web of frogs' feet with solutions of silver nitrate, silver acetate, argentin, protargol and silver acetate, followed by salt solution and "sophol." Of these silver acetate is recommended, since not more than a one per cent. solution can be made at ordinary temperatures, and it does not become concentrated and can be preserved indefinitely. Silver nitrate decomposes quickly, and the author found by experimentation that it increases in strength by evaporation from a one per cent. to an eight per cent. concentration in the course of five months.

THE TEACHING OF OPHTHALMOLOGY IN AMERICA.

Wendell Reber (*Penn. Med. Jour.,* January, 1913) summarizes his views as follows: It is our belief (1) that thoroughgoing ophthalmic instruction is to-day best obtained in a post-graduate institution with its attached clinic or clinics, the exception being in the case of those men who may attach themselves for a period of years to a well-organized ophthalmic clinic in their own cities; (2) that legislation in behalf of post-graduate teaching does not in the light of present conditions seem feasible; (3) that regulation is imminent and rational and can be more easily and readily achieved by co-operation among post-graduate institutions than by any other means now at hand; (4) that the six weeks' course should be abolished; (5) that a three months' minimum and a working year maximum course would probably furnish the best working basis for agreement among our post-graduate institutions; (6) that no applicant for post-graduate teaching, who has not completed three years in general practice or its equivalent in general hospital work, should be admitted to any of the well-organized specialty courses; (7) that certified

attendance upon a recognized ophthalmic clinic for one or more years (after three years in general hospital work) should entitle such a clinical assistant to examination for whatever degree in ophthalmology might be agreed upon among the American post graduate institutions; (8) that this plan would provide as many well-trained workers in ophthalmic science as the nation would have need of for years to come.

THE SOCIOLOGIC ASPECT OF ERRORS OF REFRACTION.

William Zentmayer (*Penn. Med. Jour.*, January, 1913) offers the following suggestions on this subject:

1. As affections of the eye that may lead to incurable blindness and consequently to an economic loss and a possible tax upon the community may have their origin in, or be aggravated by, errors of refraction, such errors when producing symptoms should at once be corrected.

2. That it would aid in the efficiency of labor and prove an economic saving for corporations or others with large office forces to require of applicants for employment an examination of the eyes by a competent ophthalmologist and, where errors of refraction are present of a degree which in his judgment require correction, to insist upon their correction.

3. That the examination of the eyes of school children should be compulsory by state law (such a law is upon the statute books of but very few states). That such examination should be made in a thorough manner by a competent ophthalmologist, and not as is done in most cities by physicians, nurses and teachers who in a perfunctory manner endeavor to ascertain only the vision and this under conditions which give entirely untrustworthy results.

4. That as it seems possible that certain types of epilepsy may have a reflex ocular origin, this question be made the subject of further careful institutional study.

5. In consequence of the adoption in many of the states, and the probably final adoption in all of the states, of workingmen's compensation laws, it is of the utmost importance to employers to have the eyes of their employees and applicants for positions examined by competent ophthalmologists and, where subnormal visual acuity exists as the result of errors of refraction, to have it brought to normal by the correction of the error.

6. That a campaign of education of the public to the danger of

entrusting the examination of the eyes and the treatment of defective vision to those whose only qualification is their assurance, and their only aim the successful accomplishment of a business transaction be carried on. That this be done through the columns of such papers as hold the public good above commercialism.

BOOK REVIEWS.

SCLERO-CORNEAL TREPHINING IN THE OPERATIVE TREATMENT OF GLAUCOMA. By R. H. Elliott, M.D., London, 1913: Geo. Pulman & Sons. Price 7s. 6d.

This monograph, by one whose name in the history of our fight against the dread disease glaucoma is indelibly written on the page which will record the operations of trephining, must be received with the greatest interest by ophthalmologists. And it is indeed a pleasure to study it, since it is a thoroughly scientific work, detailing the previous work by others which led Elliot up to his operation, followed by the recital of his own method, in the modest and yet convincing manner of the real seeker after truth.

EYE-STRAIN IN EVERYDAY PRACTICE. By Sydney Stephenson, Editor of the Ophthalmoscope. London, 1913: The Ophthalmoscope Press. Price 3s. 6d.

This monograph contains papers and lectures previously published by the author.. As he states in the preface, Stephenson, like others, with enlarged experience has become more and more convinced of the influence of eyestrain in producing general reflex neuroses. Yet that he is not visionary in his views on the subject, but sanely conservative and convinced by facts only, can be read out of every page.

OPHTHALMIC SEMIOLOGY AND DIAGNOSIS. By Charles H. Beard, M.D. With 13 colored plates and 71 Figures in the text. Philadelphia, 1913: P. Blakiston's Son & Co. Price $4.

The book by Beard forms part of the international System of Ophthalmic Practice edited by W. L. Pyle, M.D. It deals preeminently with symptoms and diagnosis. It is in every respect an excellent book. It possesses a special charm by reason of the

excellent and artistic illustrations from the author's own well-trained hand. It is a pity that the few Greek words explaining technical terms in use are so incorrectly spelled. Yet, that is a minor point and does no harm to the subject matter, which should certainly appeal to a large number of readers and students.

DIE ENTSTEHUNG DER SPHAERISCHEN REFRACTIONEN DES MENSCHLICHEN AUGES. (The origin of the spherical refractions of the human eye.) By Adolf Steiger, M.D. With 15 illustrations in the text. Berlin, 1913: S. Karger. Price 18 marks.

Not convinced of the correctness of all preceding theories, especially on the origin of myopia, the author has given years to the special study of this subject and has recorded his criticisms and opinions in this voluminous work. One of the chief contentions is that myopia is not a disease brought on by the demands of culture, and that school myopia as defined by Cohn and his followers as such does not exist, but is due to inherited defects, especially astigmatism. The reading of this book, in which, it seems everything ever written on the subject is gathered together and critically sifted, is a most interesting task. The author comes to the conclusion that the myopia question cannot possibly be solved in the old ways, and proposes new ones, paying especial attention to the developmental history of races and individuals, which the reader should study for himself. ALT.

A PRIZE IN OPHTHALMOLOGY OF 5,000 FRANCS.

Through the liberality of a generous philanthrope who desires to remain unknown, a prize of 5,000 francs will be awarded in 1914 to the best work on the ætiology, the prophylaxis or on the treatment of those forms of iritis, iridocyclitis or cyclitis which are not caused by syphilis.

No memoirs will be admitted which have not been previously presented and read before one of the ophthalmic societies in France or elsewhere. A jury composed of three members elected from among the ophthalmologists of the principal Parisian ophthalmic institutions will make the award.

Memoirs typewritten, or printed in French, English or German, must be received on or before August 15th, 1914, in the office of the Annales d'Oculistique, 26 Boulevard Raspail, Paris, France.